Elements of Chemical Reaction Engineering, third ed. H. Scott Fogler, Prentice-Hall PTR, 1999 (ISBN: 0-13-531708-9), 967 pp., Price £66.99, hardback.

'Elements of Chemical Reaction Engineering' has already gained a high reputation in the field of chemical reaction engineering (CRE), and is being widely used throughout the world. This is the third edition of the book, which has been rewritten to keep up with recent rapid progress in the field of CRE. The goals of this book are not merely to enable the reader to acquire a fundamental understanding of CRE, but also to enable him to develop critical and creative thinking skills.

There are, of course, other good books on chemical reaction engineering, by authors such as O. Levenspiel, K. Hashimoto (in Japanese and Korean) and J.M. Smith.

The book by Smith, however, treats microscopic reactions and reactors at laboratory scale. It is, therefore, suitable for chemists desiring to learn chemical reaction engineering for the operation of reactors at the laboratory scale. It is, nevertheless, difficult for students of chemical engineering courses to get a feel for industrial reactors by reading this book.

The books by Levenspiel and Hashimoto cover reaction kinetics followed by mass and heat transfer, and the design of reactors. They cover a wide range of reactions from basic homogeneous reactions to complicated bio-reactions, and also include problems designed to reinforce the understanding of these reactors. Therefore, these books are appropriate for teaching undergraduate students the fundamentals of CRE, and are widely used for such courses.

On the other hand, this book by Fogler is intended for use as both an undergraduate- and graduate-level textbook in CRE. The main feature of this book is that it fills the gap between laboratory and industrial scales in chemical reaction engineering.

It has been written in accordance with the principle that complicated CRE problems can be solved with the aid of an understanding of the basic ideas of mole balance, rate laws, stoichiometry, energy balance, diffusion and contacting. Up-to-date flow sheets of actual chemical processes are provided in many parts of the book and remind the reader that a reactor must be designed not as a single unit, but as part of a whole process. This is an important feature of this book. Many problems at different degrees of difficulty are listed at the end of each chapter so the reader can deepen his/her understanding of CRE step-by-step by solving these problems.

A novel and enriching feature of this book is the inclusion of a CD-ROM. It contains learning resources (summary notes, web modules, software, interactive computer modules and solved problems, living example problems and additional homework problems). Material important to the practising engineer, but which is not typically included in the majority of CRE courses, is also provided on this CD-ROM.

The book itself comprises fourteen chapters, each of which is devoted to a particular concept within the field of CRE. Students can learn the fundamentals of each concept by studying the first half of each chapter, the contents of which are similar to those in the books of Levenspiel and Hashimoto. The latter half of each chapter extends the readers' knowledge so that they can use the concept for designing actual reactors used in industrial processes.

When designing such reactors the reader must calculate several reactor properties, such as reactor size, product distributions and temperature profiles within the reactor. Fogler encourages the use of a computer as a tool for such calculations, and has included many problems in the book which can only be solved by the use of a computer. He also includes instructions on how to use different software packages (POLYMATH, MATLAB and ASPEN PLUS). The book starts, however, with easy problems, which can be solved either algebraically or with the aid of a computer. While solving these easy problems using a computer, the student can learn how to obtain the answer for complicated problems, which can only be solved numerically.

Even though chemical processes are evolving rapidly, the contents of CRE classes have been slow to change on account of the limited availability of information about such new industrial processes. Moreover, we had thought that complicated problems were not suitable for teaching, as only few students had access to computers a few years ago. Recently, this situation has changed and most students regularly use computers. Along with the new information provided by this book, the student can develop his/her thinking skills to solve complicated industrial problems without feeling any uneasiness. This book is, therefore, timely and is strongly recommended, not only to students, but also to engineers working in fields related to chemical processes, as an up-to-date textbook.

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